Remarks

A. Corrections to the Specification and to One of the Drawings

The Examiner's suggested new title for the application has been adopted.

Two paragraphs of the specification have been corrected so that they now cross-reference and incorporate by reference applicant's three related patents, with the cites formed from the patent numbers and their issue dates.

One paragraph has been corrected so that the reference numerals within the paragraph agree with Figure 2 of the drawings.

Figure 1, appended to the end of this document, has been revised so that the elements of Figure 1, taken collectively, are referred to in the drawing as "SYSTEM 100" rather than "UNIT 100" to bring the terminology used in Figure 1 into agreement with the specification.

Applicant respectfully requests entry of these amendments. Applicant requests that the examination continue on the basis of the amended application.

B. Rejection of the Claims Under Section 102(b)

The Examiner has rejected claims 1-3, 6-10, 13-15, and 18-20 under 35 U.S.C. §102(b) as being anticipated by Badovinatz, *et al.,* U.S. Patent No. 6,016,505. Reconsideration of this rejection is respectfully requested.

All of the independent claims 1, 9, and 13 call for a process to be added to a "distributed system," but only as a "probationary member" of the distributed system. Then communication is established between the new, probationary member of the distributed system and the other processes within the distributed system. The claims then call for a "criterion" to be evaluated to determine whether the probationary member should be promoted to full membership in the distributed system or excluded from membership in the distributed system.

The Badovinatz *et al.* patent does not teach this – its teachings differ from those of the present application and its claims. The Badovinatz *et al.* patent teaches that processor groups may be established, and it teaches further that processors may seek entry into such a group by having a process related to that group request to join a corresponding process group (Col. 5, lines 47-55). More specifically, it teaches (in Figure 12) that a process may request to join a group (step 1200). In response, the group leader performs a prescreening (step 1216) to determine "whether the attributes specified by the requesting process are the same as the attributes set by the first process of the group. If not, then the join request is rejected." (Col. 14, lines 18-21) If the prescreen test is successful, then "the providers of the process group are informed of the request via, for instance, a multicast from the group leader, and the providers vote on whether to allow the process to be added to the group .... The providers can vote to continue the protocol and vote on this join again, or they can vote to reject or approve the join." (col. 14, lines 22-29)

Hence, the Badovinatz *et al.* patent teaches that BEFORE a process is permitted to join a process group, it must tested in various ways. If any process already in the group votes against admitting the new process, then it is rejected. If any process already in the group votes to "continue," this means that the timing is not right for a new process to join, and so the voting process is postponed and later repeated. If all the processes vote to admit the new process, then it joins the group.

This is contrary to the teachings of the present invention and of the three independent claims 1, 9, and 13 presently before the Examiner. The present application and its claims teach permitting a process (a "probationary member") to join a "distributed system" – on a probationary basis, but none-the-less fully joined. Only AFTER the process has joined the distributed system (on a probationary basis) are tests conducted to see if the process meets the necessary criterion. After testing, the probationary member is either promoted to full membership in the distributed system or it is eliminated from the distributed system. For example, claim 1 reads as follows:

> 1. A method of performing one or more of adding and removing a process in a distributed system, said method comprising the steps of:
> (1) launching a probationary member in said distributed system;

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(2) establishing at least one communication path between said probationary member and at least one process in said system;

(3) evaluating at least one criterion for promoting said probationary member to a full member; and

(4) performing one of promoting said probationary member to a full member and eliminating said probationary member based on the evaluation performed in step (3).

The "criterion for promoting" called for by each of the independent claims 1, 9, and 13 is further defined in the specification as follows:

A probationary member may be created for adding or replacing a process in a system or in any role-based system. Before the probationary member can be promoted to a full member of the system (i.e., the probationary member is accepted into the view of the other processes in the system and is functional to operate collectively with other processes in the system to provide a computer service), criteria related to context information should be satisfied.

Context information includes, for example, whether the probationary member is being added to a system without replacing an existing process or whether a probationary member is replacing an existing process. When a probationary member is replacing an existing process, such as in fault-tolerant system 200, shown in FIG. 2, *criteria may include successfully establishing communication between the probationary member and other full members in the system.* The communication may be for exchanging heartbeats between the probationary member and the other processes in the system. Any required communication links between the probationary member and other processes in the system may be established in advance to avoid the risk of the inability to establish the links later. *Criteria for replacing a process may also include, successfully obtaining a state transfer, known as a checkpoint, which establishes the probationary member as a faithful mirror with the same state as the original.* A state transfer includes, for example, sending a memory image of one of the mirrors to the probationary member in a sequence of messages issued over the communication link.

When a probationary member is being added without replacing an existing process, *criteria may include successfully establishing communication between the probationary member and other full members in the system and testing the probationary member for determining whether the probationary member is collectively functioning with the other processes in the system to provide a service.* [application, page 6, lines 7 -29 – *emphasis added*]

The significance of these aspects of the present invention is illustrated in Figure 2. In the view 200, the three processes A, B, and C are operating normally, with the processes A

and B mirroring each other to provide fault tolerant service. In the view 210, at a later point in time, a fourth process D has been introduced into the group on a probationary basis, as was explained above.

> ... *In view 210, system 100 remains fault tolerant, because mirror process B has not been killed.* Then, a series of context sensitive filters are applied to determine whether to promote probationary member D to a full member of system 300 or retain process B. *If probationary member D is promoted, process B is killed.* View 230 is the view after the replacement operation. At this time, process B is killed and replaced with probationary member D, now promoted to a full member. *Only a single view change is necessary during the replacement process shown in FIG. 2, and system 100 remains fault tolerant throughout the replacement process.* [application, page 7, lines 14-21 – *emphasis added*]

Hence, the technique described in the present application and its independent claims preserves the fault-tolerant characteristics of the distributed system continuously, without a break. This technique is not taught in the Badovinatz *et al.* patent.

Accordingly, allowance of independent claims 1, 9, and 13 is respectfully requested. And since claims which depend upon allowed claims are also allowable as a matter of well-established law, allowance of the remaining claims 2-8, 10-12, and 13-20 is also respectfully requested for these same reasons.

C. Rejection of the Claims Under Section 103(a)

The Kidder *et al.* patent, which the Examiner has combined with the Badovinatz et al. patent to serve as the basis for a Section 103(a) rejection, was cited by the Examiner because it includes brief mention of mirror processing. Mirror processing, as it is described in the present application (page 2, lines 9-16), is where at least two identically-programmed processors are provided, one processor standing by to take over for the other processor in case the other processor fails. Kidder does discuss mirroring briefly (see col. 39, line 55 to col. 41, line 17 of Kidder *et al.*). But neither Kidder *et al.* nor Badovinatz *et al.* teaches adding a mirror processor to a group on a *probationary* basis and then evaluating it, using some criteria for promoting or excluding it, after it is already part of the processor group to thereby avoid even a momentary loss of fault tolerance.

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Accordingly, the claims 4-5, 11-12, and 16-17 all appear to be patentable over the combination of these two references. And, of course, these claims are also allowable because they depend upon, and incorporate by reference, the independent claims 1, 9, and 13 which are allowable for the reasons stated above.

D. Conclusion

Applicant believes that the present application, as amended, is now in condition for allowance. Early and favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if a telephone interview would advance the prosecution of the present application.
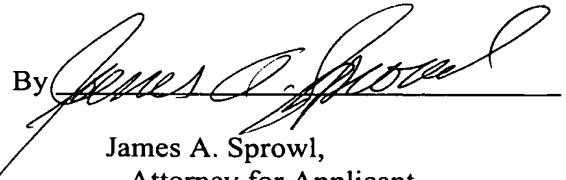
The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 08-2025. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 08-2025. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 08-2025.

Respectfully submitted,

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Amendments to the Drawings

One replacement drawing sheet is attached to the end of this document. It is submitted to correct a minor error in Figure 1. In particular, the Figure 1 drawing label "UNIT 100" has been corrected to read "SYSTEM 100" so that it matches the terminology used in the specification (for example, see the paragraph beginning at line 14 on page 5, which begins as follows: "Fig. 1 shows a fault tolerant system 100 ....")